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**AN INVESTIGATION OF DEVONIAN RHYNCHOMELLIDS  
OF THE  
GREAT WESTERN BASIN**

**L. B. MACRAE**

**1955**

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The Department of Geology, University of Alberta, considers that this thesis represents a contribution to the science of geology of considerable merit. The findings expressed in this thesis are not necessarily the views of the members of the Department of Geology.



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1955  
419.

UNIVERSITY OF ALBERTA

AN INVESTIGATION  
OF THE  
DEVONIAN RHYNCHONELLIDS  
OF THE  
GREAT WESTERN BASIN

A DISSERTATION  
SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF SCIENCE

FACULTY OF ARTS AND SCIENCE  
DEPARTMENT OF GEOLOGY

by

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EDMONTON, ALBERTA

April \_\_\_\_\_





ABSTRACT

Study has been made of 19 species of Devonian rhynchonellid brachiopods, including 7 species of Nudirostra; 1 species of Basilicorhynchus; 5 species of Camarotoechia; 2 species of Pugnoides; 3 species of Hypothyridina; and 1 species of Eatonia.

Internal sections are figured and described of at least one species of each genus from the University of Alberta collections.

An attempt has been made to place the Devonian Rhynchonellids in previously determined Rhynchonellid zones, although little information is available to the exact stratigraphic positions of the collections.

The Devonian Rhynchonellid zones are compared to the zones proposed by Warren and Stelck (1950), with an attempt to clarify any discrepancies which arise. General conclusions follow the above comparisons.



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## INTRODUCTION

### General Statement

Several papers have been written on the Devonian in which fossil zones have been outlined. McLaren (1954) was the first to zone the Upper Devonian completely on Rhynchonellids.

The purpose of this thesis is to attempt to prove or disprove the presence of zones in the North West Territories, to delimit Rhynchonellid occurrences in the Middle Devonian and to facilitate future identification of common Devonian Rhynchonellids. In addition the writer has compared the present Rhynchonellid zones with zones proposed by Warren and Stelck (1950) with the view in mind of indicating any discrepancies which have arisen.

Finally, in the general conclusions, the writer considers the advisability of using Rhynchonellid zones within the Devonian.

### Present work

The present work is a study of Devonian Rhynchonellid brachiopods which are listed in appendix A. Internal sections of specimens are listed in appendix B, with the asterisk ones appearing on plate 2. Most of the specimens examined were obtained from the Department of Geology, University of Alberta. These specimens with a few exceptions were originally collected from the North West Territories.

The writer attempts to place the Devonian Rhynchonellids in previously determined Rhynchonellid zones, although little information was available to the exact stratigraphic intervals from





which the specimens were collected. (fig. 3)

### Technique

In making serial sections, the fossil was mounted in red sealing wax so that it was properly orientated at all times during grinding. Sealing wax was found to be the best substance as a mount because: it is easy to obtain; it has a low melting point; it solidifies quickly; its hardness is high enough to grind without melting, yet, it is sufficiently low to allow for rapid grinding; and it can be used several times without spoiling the above mentioned qualities. Drawings were made with the use of a camera lucida.

The fossils were coated with ammonium chloride to prepare them for photography.

### Previous work

Warren (1949) outlined 8 zones in the Devonian none of which are based upon Rhynchonellids.

Warren and Stelck (1950) divided the Devonian of Western Canada into twenty zones (fig. 1) of which two are based on Rhynchonellids, one in the Upper Devonian and one in the Middle Devonian.

D. J. McLaren (1954) proposed seven Rhynchonellid zones for the Upper Devonian in the Canadian Rocky Mountains. (fig. 2)







FORMATIONS		RHYNCHONELLID ZONES	IMPORTANT FOSSILS
EXSHAW			
PALLISER	COSTIGAN MEMBER	Nudirostra utchensis ventricosa	Productella cf plicata, Cyrtospirifer cf kindlei, Strophopleura notabilis,
	MORRO MEMBER	Nudirostra gibbosa <del>g</del> versoni	Productella lata, Camarotoechia banffensis, C nordeggi, Cyrtospirifer cf animasensis, Cyrtiopsis sp
ALEXO		Nudirostra gibbosa walcotti	Athyris cf angelicoines, Leptodesma sp
MOUNT HAWK		Nudirostra albertensis	Hypothyridina cf emmonsii, Pugnoides calvin, Cyrtospirifer cf whitneyi, Spirifer strigosus, Tenticospirifer cf cyrtiniforms
PERDRIX		Nudirostra insculpta	Calvinaria inelegans, Martiniopsis cf nevadensis
FLUME	UPPER MEMBER	Nudirostra athabascensis	Eleutherokomma cf hamiltoni, E cf leducensis, Ambothyris cf sublineata, Athyris parvula, Bactrites sp
	LOWER MEMBER	Pugnoides kakwaensis v	Atrypa cf albertensis, A cf independensis, Cyrtina billingsi, Spirifer cf engelmanni

Figure 2

Western Devonian Rhynchonellid Zones in the Canadian Rockies  
by

McLaren 1954 p 160





### Acknowledgments

Special thanks are due Dr. S. J. Nelson for criticisms in the fossil descriptions. The writer is indebted to Dr. C. R. Stelck who read parts of the manuscript and made many helpful suggestions. Finally the author wishes to express his sincere appreciation to Dr. P. S. Warren (Chairman of the Department of Geology, University of Alberta), under whose supervision this thesis was prepared, and who extended the use of fossil collections acquired by the Department over a number of years. Without the use of these collections this thesis could never have been completed.





DEVONIAN RHYNCHONELLID ZONES

The Devonian Rhynchonellid zones are compared to the zones proposed by Warren and Stelck (1950), with an attempt to clarify any discrepancies which arise. The studies reveal certain new conclusions regarding zoning of the Devonian.

NUDIROSTRA UTAHENSIS ZONE

The Nudirostra utahensis zone is the same zone as Hume's (1922) Athyris angelica zone and McLaren's (1954) Nudirostra utahensis ventricosa zone. The writer proposes the use of the term Nudirostra utahensis zone because Nudirostra utahensis has a much larger areal extent than Nudirostra utahensis ventricosa. Nudirostra utahensis ventricosa zone as outlined by McLaren is represented in the Costigan member of the Palliser formation. Known occurrences of the sub-species are in Montana and the Canadian Rocky Mountains. The writer has not recognized the sub-species from the North West Territories collections.

In Utah where Nudirostra utahensis (Kindle) was first described it immediately underlies the Mississippian. Associated species were Spirifer disjunctus (sensu lata) (and Productella spinulicosta) which Warren and Stelck (ibid.) state has a range that includes their Athyris angelica zone.



MIDDLE DEVONIAN			UPPER DEVONIAN							TENTATIVE	
FINE POINT	FRANKFURT	CAVERSHILL	FLUKE		PULVER	HOOVER	ALAMO	PALLISER		KASHA	Devonian Rhynchonellid species of the Great Western Basin
			LOWER	UPPER				HOOVER	GOSEICAN		
									*		<i>Nudirostra utahensis</i>
								*			<i>N. walcotti</i> var. <i>seversoni</i>
							*				<i>N. walcotti walcotti</i>
						*					<i>N. albertensis</i>
			?								<i>Nudirostra</i> sp.
			*								<i>N. castanea</i> var. <i>a</i>
		*									<i>N. castanea</i> var. <i>a</i>
											<i>N. castanea</i> var. <i>b</i>
											<i>Caryorhynchus carya</i>
											<i>Basilicorhynchus basilicum</i>
											<i>Camarotoechia</i> sp. cf. <i>C. contracta</i>
											<i>C. nordeggi</i>
											<i>C. banffensis</i>
											<i>C. shineri</i>
							*				<i>Camarotoechia</i> sp. cf. <i>C. unca</i>
											<i>Camarotoechia</i> sp.
											<i>Eugnoides</i> sp. cf. <i>E. duplicatus</i>
			*								<i>P. kalwensis</i>
						*					<i>Hypothyridina</i> sp. cf. <i>H. moroni</i>
	*										<i>H. caneroni</i>
							*				<i>Hypothyridina</i> sp. cf. <i>H. angulata</i>
											<i>Eatonia</i> sp.

FIGURE 3. Devonian Rhynchonellid species of the Great Western Basin



In the Athyris angelica zone Hume mentioned that he found small, flat Leiorhynchus species which the writer suspects is Nudirostra sp. cf. N. utahensis (p.19)

Nudirostra utahensis in addition to occurring in Utah and the North West Territories, is found in subsurface in the plains of southern Alberta, (p. 18) in the Three Forks formation. Previous workers make no mention as to its occurrence in the Canadian Rocky Mountains. There it seems to be represented by its variety Nudirostra utahensis ventricosa in the Costigan member of the Palliser formation.

The writer has examined some of the important Rhynchonellid species which occur in the Nudirostra utahensis zone. They are listed as follows:

Camarotoechia nordeggi Kindle

Camarotoechia shimeri Warren

Camarotoechia banffensis Warren

Eatonia sp. (p. 49)

Camarotoechia shimeri and C. banffensis are found in the uppermost beds of the Palliser formation in the Nudirostra utahensis zone. Apparently the latter species has been misidentified by McLaren as he wishes to place the species in his N. walcotti var. seversoni zone. This would give the species an abnormal range. It has not been recognized in any of our collections from the N. walcotti var. seversoni zone.

Camarotoechia nordeggi according to McLaren (1954) has been collected from the Morro member of the Palliser formation. Warren and Stelck (1950) state that C. nordeggi ranges from their Leiorhynchus walcotti zone to the Athyris angelica zone.





Eatonia sp. (p. 49) might well be the Eatonia sp. that Hume (1922) includes in his Athyris angelica zone.

NUDIROSTRA WALCOTTI VAR. SEVERSONI ZONE

Merriam (1940) states that Leiorhynchus walcotti Merriam includes individuals which resemble forms from the Three Forks formation of Montana. These include Leiorhynchus jeffersonensis Haynes, Leiorhynchus madisonensis var. gibbosum Haynes, and Leiorhynchus madisonensis Haynes.

McLaren (1954) recognized two sub-species of Nudirostra walcotti which he called Nudirostra gibbosa seversoni and Nudirostra gibbosa walcotti with the inference that they were conspecific with the sub-species N. madisonensis var. gibbosum (-N. gibbosa gibbosa.)

The writer is of the opinion that it would be better to consider seversoni as only a variety of Nudirostra walcotti, since none of the specimens the writer has seen are similar to Nudirostra madisonensis var. gibbosum. Therefore the author shall speak of Nudirostra walcotti var. seversoni throughout the paper to represent McLaren's N. gibbosa seversoni.

Nudirostra walcotti var. seversoni McLaren is widespread in Western North America. It occurs from the North West Territories throughout the Canadian Rocky Mountains, (probably under the plains), south to at least the Roberts Mountains Region of Nevada.





Warren and Stelck (1950) designated the Platyclymenia zone above the silt in the Upper Devonian (fig. 1) based on the occurrence of Platyclymenia in the Three Forks formation of Montana, but the genus is unknown as yet in the Canadian Rocky Mountains (McLaren, 1954). The Platyclymenia zone should be within the range of the Nudirostra walcotti var. seversoni zone.

In the N. walcotti var. seversoni horizon Camarotoechia nordeggi Kindle is listed by McLaren (ibid.) as an important species. This seems to place C. nordeggi too low in the section.

#### NUDIROSTRA WALCOTTI WALCOTTI ZONE

Warren and Stelck (ibid.) place the Leiorhynchus walcotti zone wholly within the Palliser formation. McLaren (ibid.) has shown that this zone can be divided into two zones. The upper zone being the Nudirostra walcotti var. seversoni zone and the lower the Nudirostra walcotti walcotti zone. As previously mentioned, the Nudirostra walcotti var. seversoni zone is included in the Morro member of the Palliser formation. The Nudirostra walcotti walcotti zone includes the Alexo formation according to McLaren (ibid.).

The Nudirostra walcotti walcotti zone of McLaren appears to embrace the following zones of Warren and Stelck.

Manticoceras zone

Spirifer strigosus zone (p. 13)



The following is a list of important Rhynchonellid species associated with this zone.

Hypothyridina sp. cf. H. magister Belanski

Basilicorhynchus basilicum (Crickmay)

Camarotoechia sp. cf. C. unca Stainbrook

Camarotoechia sp. cf. C. contracta (Hall and Whitfield)

Pugnoides sp. cf. P. duplicatus (Hall)

Hypothyridina sp. cf. H. magister has been found in the Upper Bosworth sandstone of the Imperial formation, a correlative of the Alexo formation (Graminia, ie. true silt) of the Rocky Mountains.

Basilicorhynchus basilicum according to Crickmay has a stratigraphic range in that part of the Hay River formation, N. Nahanni River, which is equivalent to the Alexo and Palliser formations. At present this species is known in only the Hay River formation, North West Territories.

Camarotoechia sp. cf. C. unca was collected from the Nisku (D-2) formation, which correlates with the lowermost Alexo formation (p. 12). The writer does not know the stratigraphic range of this species.

Camarotoechia sp. cf. C. contracta according to Hume (1922) is abundant at certain horizons in his Leiorhynchus zone. It is impossible to delimit the range of this species closer than from the probable base of Alexo formation to the top of the Morro member of the Palliser formation.



Pugnoides sp. cf. P. duplicatus was listed by Hume (ibid.) as rare in the Leiorhynchus zone. The stratigraphic range of this species is probably similar to that of Camarotoechia sp. cf. C. contracta.

#### NUDIROSTRA ALBERTENSIS ZONE

Nudirostra albertensis (Warren) is used by McLaren (1954) in zoning the Upper Devonian. This species occurs in the Mount Hawk formation, the Uppermost Perdrix formation, the Hay River formation and in several wells in the plains of Alberta.

The placing of the upper boundary of the N. albertensis zone has been erratic. This is because of the transitional boundary between the Mount Hawk formation and the Alexo formation. The Alexo formation thickens northward from Jasper indicating a source of sediment from the north and west, probably the Spirit River High. This would seem that there is a diachronic boundary between the Mount Hawk formation and the Alexo formation.

The Alexo is a poorly defined lithologic unit as it not only includes the true silt (undoubtedly Graminia), but a limestone facies which south of Jasper becomes an evaporite sequence (Calmar equivalent). The limestone facies represents the Spirifer strigosus zone of Warren and Stelck (1950, p. 67). At Medicine Lake underlying the argillaceous limestones are calcareous mudstones which are probably the Nisku (D-2) correlatives. McLaren stated that at Medicine Lake he collected many specimens of Nudirostra walcotti walcotti in the lower 300 feet of the Alexo formation.





Although McLaren (1954) listed Spirifer strigosus in the N. albertensis zone it does not mean that the Spirifer strigosus zone lies within the N. albertensis zone. It is known that Spirifer strigosus has a fairly long stratigraphic range from the upper Macgeea proteus zone through to above the Spirifer strigosus zone. The tell-zone is based on an association of fauna and not solely on the species.

Therefore it is evident that Spirifer strigosus zone of Warren and Stelck (1950) is within the broader Nudirostra walcotti walcotti zone of McLaren (ibid.).

Nudirostra albertensis zone probably includes the following zones of Warren and Stelck (ibid.).

Platyrachella cyrtiniformis zone (D-2) equivalent

Macgeea proteus zone

Eleutherokomma reidfordi zone

Eleutherokomma reidfordi may lie partly in the N. insculpta zone, although it may well be entirely in the N. albertensis zone.

#### NUDIROSTRA INSCULPTA ZONE

Nudirostra insculpta McLaren was not recognized in any of the collections the writer examined. McLaren (ibid.) states that forms similar to N. insculpta have been reported from the North Nahanni River and Carcajou Mountain, North West Territories. This zone was proposed by McLaren (ibid.) to represent the Perdrix formation and its equivalents. The Buchiola retrostriata zone as outlined by Warren and Stelck is the same zone.





NUDIROSTRA ATHABASCENSIS ZONE

Nudirostra athabascensis (Kindle) is widespread under the plains abundant in the Canadian Rocky Mountains, but, northwards little is known regarding this species. The N. athabascensis zone includes the Eleutherokomma leducensis and E. hamiltoni zones of Warren and Stelck (1950). The N. athabascensis zone is the Upper Flume and its equivalents.

PUGNOIDES KAKWAENSIS ZONE

This zone was outlined by McLaren (1954) to embrace the lower part of the Flume formation. The writer describes a Pugnoides kakwaensis (p. 42) which was collected from the Ancient Wall. Three poorly preserved specimens which may be P. kakwaensis were found in the Hay River formation, North Nahanni River, North West Territories.

A collection that arrived at the University of Alberta too late for complete examination shows many specimens of Pugnoides sp. cf. P. kakwaensis. These specimens were collected from ten miles up the Root River, North West Territories. The collector gave little information regarding the exact stratigraphic position of the collection. The specimens show a great range of variability of individuals and indicate a difference from P. kakwaensis s.s.



The P. kakwaensis zone would seem to include much of the Spirifer allani zone of Warren and Stelck (ibid.) The Lingula sp. cf. L. spatulata zone lies below the P. kakwaensis zone.

#### NUDIROSTRA CASTANEA ZONE

This zone was proposed by Warren and Stelck (1950) to represent the Basal Fort Creek formation and its equivalents (i.e. Hay River formation). This zone is restricted to the North West Territories as Nudirostra castanea (Meek) had not been found elsewhere.

The writer knows of three varieties of N. castanea, each variety being restricted in its stratigraphic range, that is the varieties can be used as horizon markers. Nudirostra castanea castanea has been found in the Basal Fort Creek formation. Similar specimens have been collected from a limestone formation near Prairie Creek, about 25 miles S.E. of Tuchodi Lakes, British Columbia. Nudirostra castanea var. a is restricted to the Upper Ramparts (Beavertail) formation. Nudirostra castanea var. b ranges from the Pine Point formation through to the Presqu'ile formation.

Hypothyridina cameroni along with a Camarotoechia sp. (p. 39) have been found in the Presqu'ile formation. This Camarotoechia sp. also occurs in the Pine Point formation.

The following table demonstrates the position of the faunas in the stratigraphic column.



Basal Fort Creek shale	<u>Nudirostra castanea castanea</u>
Upper Ramparts (Beavertail?) limestone	<u>Nudirostra castanea</u> var. <u>a</u>
	<u>Nudirostra castanea</u> var. <u>b</u>
Presqu'ile dolomite	<u>Hypothyridina cameroni</u>
	<u>Camarotoechia</u> <u>sp.</u>
	<u>Nudirostra castanea</u> var. <u>b</u>
Pine Point limestone	<u>Camarotoechia</u> <u>sp.</u>

### CONCLUSIONS

The genus Nudirostra is a reasonably good zone fossil for the Devonian of Western Canada. Taken in conjunction with other rhynchonellids the vertical distribution is satisfactory for broad zonal purposes. For more refined zoning, such as that proposed by Warren and Stelck (1950), it would not be satisfactory, as the genus appears to be entirely lacking at certain horizons. Also its lateral distribution is unsatisfactory, undoubtedly due to ecologic conditions. It appears to be more sensitive by ecologic shift than most other groups, except corals. This is especially true of the N. walcotti (sensu lata) rank in the upper Devonian. The genus appears in large quantities in some areas, almost to the exclusion of other genera, however it is almost entirely lacking at the same horizons in other areas.





The same factors are troublesome if any other single genus or taxonomic group is selected for zoning the Devonian. Corals would be useful at certain horizons, but the group almost entirely fails at other horizons and coral do not extend to the top of the Devonian in Western Canada. The ubiquitous genus Atrypa has good zonal possibilities, but the difficulty of distinguishing species or varieties mitigates against its use. The genus also fails to reach the top of the Devonian in Western Canada.

The genus Spirifer (sensu lata) appears to offer the best possibilities for refined zonal purposes. Some forms of Spirifer seem to be present at most horizons and the Genus (Spirifer) extends throughout the Devonian. Ecological factors seem to be less troublesome than with other groups.

Ammonites are too scarce in the Western Canadian Devonian to be of much value in zoning and other Mollusca are, on the whole, in the same category.

The results of this study show that, without a statistical approach, the Leiorhynchids have too much intra specific variation to be used for practical zoning purposes, unless large quantities of specimens are successively and continuously collected throughout the Devonian section under study.





SYSTEMATIC PALEONTOLOGY

Genus Nudirostra Cooper and Muir Wood (1951)

Nudirostra utahensis (Kindle)

Pl. 1, figs. 1-5

1908 Leiorhynchus utahensis Kindle, Bull. American Pal., vol. 4,  
no. 20, p. 27, pl. 3, figs. 1-1c

LOCALITY AND HORIZON

One specimen from a well "south of Province, Alberta", Upper Devonian, in the Green shale undoubtedly Three Forks formation.

DESCRIPTION

Shell large, bi-convex, relatively flat, sub-circular in outline. Greatest width at mid-length. Maximum thickness posterior to mid-length. Costae broad, round, beginning near the beaks although umbones smooth. Growth lines distinct and quite dominant.

Ventral valve characterized by strongly convex beak and umbo. Sinus shallow, broad, containing 3 costae, beginning posterior to mid-length. Flanks smooth and relatively flat.

Dorsal valve more convex than ventral. Beak incurved and hidden by ventral beak. Fold wide, flat on top, with 4 costae, beginning posterior to mid-length, prominent only at anterior margin. Lateral slopes gently convex, smooth with faint suggestion of a very broad costae.



DIMENSIONS<sup>1</sup>

L	W	T	L/T	W/T	W/L
20	25	15	1.3	1.6	1.2

COLLECTION AND REPOSITORY

Suite No. Dv. 1320, University of Alberta, Department of Geology.

DISCUSSION

The internal structures were not investigated as only one specimen was available.

N. utahensis differs from N. utahensis var. ventricosum in its smaller size, and greater number of plications on the sinus and fold. "An average specimen of N. utahensis var. ventricosum has a width of 37 mm., height 35 mm., and convexity 28 mm." (Haynes 1916, p. 41) Species similar to N. utahensis var. ventricosum have been collected by McLaren (1954, p. 180.) from the Costigan member of the Palliser formation on Mount Coleman, Banff National Park, Alberta.

Nudirostra sp. cf. N. utahensis (Kindle)

Pl. 1, figs. 6-15. Pl. 2, figs. 15-22

LOCALITY AND HORIZON

Collection of approximately 25 specimens, Upper Devonian, Hay River formation, Camsell Bend, Mackenzie River, N. W. T.

1 All dimensions unless otherwise mentioned are in mm.



## DESCRIPTION

Shell large, bi-convex, relatively flat. Outline triangular, occasionally sub-circular. Greatest width slightly anterior to mid-length. Maximum thickness posterior to mid-length. Costae broad, round, beginning near umbones. Growth lines common.

Ventral valve convex only in umbonal area. Sinus broad, shallow, with 2 to 3 costae, beginning posterior to mid-length. Flanks gently convex to nearly flat, and may be smooth or bear up to 4 costae.

Dorsal valve more convex than the ventral. Beak hidden. Fold broad, flat on top to gently curved, with 2 to 4 costae, beginning posterior to mid-length. Lateral slopes gently convex, maybe smooth or have up to 4 costae.

Internal structures of ventral valve consist of reduced dental plates extending to floor. No teeth development visible. Dorsal interior with strong medial septum, divided hinge plate with no apparent socket development, crura strong.

## DIMENSIONS

L	W	T	L/T	W/T	W/L
12.5	13	5.5	2.2	2.4	1.0
24	27	11.5	2.2	2.3	1.1
16	17	7.5	2.1	2.2	1.0

The first part of the paper discusses the importance of the study of the history of the United States. It is argued that the study of the history of the United States is essential for a full understanding of the country and its people. The second part of the paper discusses the importance of the study of the history of the United States. It is argued that the study of the history of the United States is essential for a full understanding of the country and its people.

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Year	1900	1910	1920	1930	1940
Population	76,000,000	92,000,000	106,000,000	123,000,000	132,000,000
GDP	\$10,000,000,000	\$15,000,000,000	\$20,000,000,000	\$25,000,000,000	\$30,000,000,000
Life expectancy	47 years	50 years	54 years	58 years	61 years



COLLECTION AND REPOSITORY

Suite 717, University of Alberta, Department of Geology.

DISCUSSION

These specimens seem to be closely related to N. utahensis but differ in that most exhibit costae on the anterior lateral slopes. They appear to be the same as Hume (1922, p. 72B.) mentions, but does not describe, which occur above the "Leiorhynchus zone."

Nudirostra walcotti var. seversoni McLaren

Pl. 1, figs. 16-20    Pl. 2, figs. 9-14

1940 Leiorhynchus walcotti Merriam, Geol. Soc. America, spec. paper 25, p. 82, pl. 9, fig. 7.

1954 Nudirostra gibbosa seversoni McLaren, Bull. American Ass. Pet. Geol., vol. 2, no. 1, p. 180, pl. 1, figs. 4-8.

LOCALITY AND HORIZON

Several specimens from the south west side of the Root River, N. W. T.; nearly a hundred specimens from Camsell Bend, N. W. T.; and about 10 specimens from the North Nahanni River, N. W. T., Upper Devonian, Hay River formation.

DESCRIPTION

Shell medium in size, bi-convex, sub-pentagonal in outline. Greatest width and thickness anterior to mid-length. Proportionate width of this species tends to be less than N. walcotti walcotti. Costae broad, round, beginning near beaks, although umbones of most specimens smooth.

Ventral valve with upturned beak hiding dorsal. Sinus broad,



shallow, abrupt at anterior margin, beginning at umbo, containing 2 to 3 costae. Flanks gently convex, with 2 costae confined to antero-lateral margin.

Dorsal valve more convex than ventral. Fold wide, nearly flat on top, prominent at anterior margin, beginning at umbo, with 3 to 4 costae. Lateral slopes steep, smooth except for usually 2 costae confined to the antero-lateral margin.

The internal structures are similar to those of N. walcotti walcotti.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
19	20	15	1.2	1.3	1.0
20	22	13.5	1.5	1.6	1.1
15	17.5	10	1.5	1.75	1.1
11	12.5	8	1.3	1.6	1.0
14	15	20	.95	1.2	1.25

#### COLLECTION AND REPOSITORY

Suite 717, 7184, and 7149.E., University of Alberta, Department of Geology.

#### DISCUSSION

McLaren (1954, p. 179.) stated that he considered N. gibbosa seversoni conspecific with N. madisonensis var. gibbosum (Haynes).



This correlation has not been proven, neither has it been disproven. The writer, therefore, has changed the name of the species to N. walcotti var. seversoni, as it is a sub-species (Merriam).

Nudirostra walcotti walcotti (Merriam)

Pl. 1, figs. 21-25

1940 Leiorhynchus walcotti Merriam, Geol. Soc. America, spec. paper 25, p. 82, pl. 9, figs. 4-8. (includes detailed synonymy)

1954 Nudirostra gibbosa walcotti (Merriam) McLaren, Bull. American Ass. Pet. Geol., vol. 2, no. 1, p. 180, pl. 1, figs. 9-13.

LOCALITY AND HORIZON

Camsell Bend, N. W. T., Upper Devonian, Hay River formation.

DESCRIPTION

Shell medium sized, rotund, bi-convex, sub-pentagonal in outline. Greatest width and thickness near anterior margin. Costae angular, coarse, beginning at beaks.

Ventral valve convex with beak curved and hiding dorsal beak. Sinus broad, short, abrupt, beginning mid-length, with 3 costae, but, occasionally 2 or 4. Flanks steep with up to 4 costae.

Dorsal valve more convex than ventral. Fold broad, prominent at anterior margin, beginning mid-length, containing up to 5, commonly, 3 or 4 costae. Lateral slopes steep, with up to 6, commonly 4, costae.

Internal structures of ventral valve consist of reduced dental plates extending to floor. Dorsal interior with strong medial septum of variable width; divided hinge plate with no apparent socket develop-





ment; and strong crural plates which are outgrowths of hinge plate.

# DIMENSIONS

L	W	T	L/T	W/T	W/L
17.5	20	17.5	1.0	1.1	1.1
18.5	21	16.5	1.1	1.1	1.2
15	18	14	1.1	1.2	1.2
23	26	18	1.2	1.4	1.1

# COLLECTION AND REPOSITORY

Suite 717, University of Alberta, Department of Geology.

# DISCUSSION

Poor preservation is possibly the reason why no socket development was seen during sectioning.

McLaren found specimens of this species in the Alexo formation on Prospect Mountain near Mountain Park, Alberta, and on Proposal Mountain, south end of Medicine Lake at Jasper National Park, Alberta.

## Nudirostra albertensis (Warren)

Pl. 1, figs. 26-30, Pl. 2, figs. 4-8

1928 Leiorhynchus albertensis Warren, Trans. Royal Soc. Canada, ser. 3, vol. 22, sec. 4, p. 117, pl. 1, figs. 1-5

1954 Nudirostra albertensis (Warren) McLaren, Bull. American Ass. Pet. Geol., vol. 2, no. 1, p. 179, pl. 1, figs. 14-18.





LOCALITY AND HORIZON

Upper Devonian Suite 18B

DESCRIPTION

Shell small, bi-convex, sub-circular in outline. Greatest width mid-length. Maximum thickness posterior to mid-length. Costae very broad, round, beginning anterior to mid-length.

Ventral valve slightly less convex than dorsal. Sinus shallow, broad, beginning mid-length, usually with 1 costae. Flanks gently convex, generally smooth.

Dorsal valve convex with beak incurved and hidden by large up-turned ventral beak. Fold low, beginning anterior to mid-length, with usually 2 costae. Lateral slopes smooth and gently convex.

Internal structures of ventral valve consist of reduced dental plates extending to floor. Dorsal interior with strong medial septum which is variable in depth, ranging from small and wide to deep and narrow, Hinge plate divided with no apparent socket development. Crura strong and deep.

DIMENSIONS

L	W	T	L/T	W/T	W/L
14	14	9	1.5	1.5	1.0
14	15	?	?	?	1.0
12	14	8.5	1.4	1.6	1.0
13	15	10	1.3	1.5	1.0



COLLECTION AND REPOSITORY

Suite 18B, University of Alberta, Department of Geology.

DISCUSSION

This species differs from Nudirostra glaber (Kindle) by its smaller size and sharper costae. Similarly it is distinguished from Nudirostra parviplicatum (Kelly) by its comparatively narrower form and much smaller size. McLaren (1954, p. 179.) stated that although most of his specimens had smooth flanks, less than a third showed as many as 5 weakly defined costae.

Poor preservation is possibly the reason why no tooth and socket development was seen during sectioning.

Nudirostra sp.

Pl. 1, figs. 31-35 Pl. 2, figs. 23-29

LOCALITY AND HORIZON

Ramparts Plateau, Mackenzie River, N. W. T. The age may range from Middle Devonian to Upper Devonian. The collection could have come from either the Hare Indian River formation or the Fort Creek formation.

DESCRIPTION

Shell medium in size, bi-convex, triangular to sub-pentagonal in outline. Greatest width mid-length. Maximum thickness at or near



anterior margin. Costae broad, round, beginning at mid-length.

Ventral valve convex, beak upturned, hiding dorsal one. Sinus short, abrupt, beginning mid-length, with 2 to 3 costae. Flanks gently convex with up to 4 costae occupying the antero-lateral margin.

Dorsal valve more convex than ventral. Fold round, beginning mid-length with 3 to 4 costae. Lateral slopes smooth, except for up to 4 costae on antero-lateral margin.

Internal structures of ventral valve consist of reduced dental plates extending to thick callus in lateral portion of shell. No apparent teeth. Dorsal interior with strong, narrow, deep, medial septum. Hinge line divided and composed of two plates per side, outer plates with socket development and inner plates straight. Crura outgrowths of inner hinge plates.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
18	20	18	1.0	1.1	1.1
20	22.5	16.5	1.2	1.6	1.1
17.5	19	13.5	1.3	1.4	1.1

#### COLLECTION AND REPOSITORY

Suite 42023 and 42015, University of Alberta, Department of Geology





## DISCUSSION

This species differs from N. walcotti walcotti in that the costae are confined to the anterior region whereas in the latter the costae begin at the beaks. It is distinguished from N. walcotti var. seversoni in having a greater number of costae on the flanks.

Nudirostra castanea castanea (Meek)

Pl. 3, figs. 1-5.

- 1868 Rhynchonella castanea Meek. Trans. Chicago Acad. Sci. vol. 1,  
p. 93, pl. 8, fig. 9.  
1944 Leiorhynchus castanea (Meek). Warren, Trans. Royal Soc.  
Canada, ser. 3, vol. 38, sec. 4, p. 111, pl. 1, Figs. 6-10,  
(includes detailed synonymy)

## LOCALITY AND HORIZON

Upper Devonian, Basal Fort Creek formation.

## DESCRIPTION

Shell medium in size, bi-convex, "German steel helmet" in profile, ellipsoidal in outline. Greatest width mid-length and maximum thickness slightly posterior to mid-length. Costae very faint.

Ventral valve characterized by small upturned beak. Sinus short, shallow, beginning anterior to mid-length with up to 5 faint costae. Flanks nearly flat at mid-length, strongly convex near beak, and form a sharp ridge with anterior margin.

Dorsal valve strongly convex, beak hidden. Fold gently round, beginning mid-length with up to 5 faint costae. Lateral slopes smooth



and steep.

Internal structures of ventral valve consist of reduced dental plates extending to floor. Teeth well developed. Dorsal interior with strong, deep medial septum. Crura outgrowths of medial septum. Hinge plate divided with sockets pronounced.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
18	20	15	1.2	1.1	.9
23	22	19	1.3	1.3	1.1

#### COLLECTION AND REPOSITORY

Suite 47772 and 45595, University of Alberta, Department of Geology

#### DISCUSSION

From an examination of numerous specimens of N. castanea, the writer has come to the conclusion that there may be three varieties of the species, all with identical internal structures. The Beaver-tail specimens possibly might be Caryorhynchus as sectioning never determined whether or not the dental plates extended to the floor of the ventral valve.

The Upper Ramparts (Beavertail?) variety we will call N. castanea



var. a Warren and Stelck (1950) designated similar specimens as Nudirostra sp. cf. N. castanea. It differs from N. castanea castanea in that it is twice the size. In profile and outline the two varieties are identical.

The Presqu'ile and Pine Point variety we will name as N. castanea var. b. It is distinguished from the above two varieties in that the two valves are in general nearly equally convex and the commissure is usually a straight line. The profile is not the "German steel helmet" type. The flanks are marked with costae, usually over 3, and up to 7, which are traceable to the mid-length at least. N. castanea var. b is always wider than long which is not always true of the other varieties. The table below will give a comparison of the dimensions of the three varieties.

L	W	T	L/T	W/T	W/L	
18-23	20-22	15-19	1.2-1.3	1.1-1.3	.9-1.3	<u>N. castanea castanea</u>
26-35	26-30	20-26	1.3	1.2-1.5	1.0	<u>N. castanea</u> var. <u>a</u>
12-21	14-28	9-18	1.1-1.3	1.3-1.5	1.1-1.4	<u>N. castanea</u> var. <u>b</u>

So far as the writer know these specimens are the only ones belonging to Nudirostra in which crura are outgrowths of the medial septum. It is not certain if the above condition holds true for Caryorhynchus. If such is the case it would perhaps be best to reclassify both and place them in a new genus. The reason for such a suggestion is that N. castanea does not have the external appearance of the majority of the Nudirostra. It bears a striking similarity to Caryorhynchus. If both were placed in a new genus, then we would have two species, externally





somewhat alike, but internally differing. (The dental plates of Caryorhynchus carya do not extend to the floor of the ventral valve.)

Genus Caryorhynchus Crickmay, (1952)

Caryorhynchus carya (Crickmay)

1952 Leiorhynchus carya Crickmay, Jour. Pal., vol. 26, no. 4, p. 599, pl. 70, figs. 1-5 and 8-11.

1952 Caryorhynchus carya (Crickmay), Imperial Oil, Ltd., Oct. (private publication.)

#### LOCALITY AND HORIZON

"Pine Point formation to Perdrix formation, or Middle Devonian to mid Upper Devonian" (Crickmay 1952, Oct.)

#### DESCRIPTION

"Rotund, tumid, leiorhynchidae. Apical callus, abundant, extensive. Anterior commissure, strongly uniplicate (to episulcate). Fold and sulcus, from umbo to anterior. Lateral slopes, short, steep. Plications confined to fold and sulcus. Dental lamellae, short, never reaching floor of valve, much abbreviated at maturity." (Crickmay 1952, Oct.)

#### DISCUSSION

"The description of the commissure as uniplicate may not apply to all species which belong here, the form may range to parasulcate or episulcate. Also, in the earlier species, weak vestigial plications can be detected on lateral slopes, and even in late species, adventitious plication or costation occurs rarely on part of the shell.

"Caryorhynchus parallels Leiorhynchus in its history. It has not been traced back to a common origin however. Comparable species is Leiorhynchus castanea. "(Crickmay 1952, Oct.)



Genus Basilicorhynchus Crickmay, (1952)

Basilicorhynchus basilicum (Crickmay)

Pl. 1, figs. 36-40    Pl. 2, figs. 30-34

1952 Leiorhynchus basilicum Crickmay, Jour. Pal., vol. 26, no. 4,  
p. 600, pl. 70, figs. 12-21.

1952 Basilicorhynchus basilicum (Crickmay), Imperial Oil Ltd., Oct.  
(private publication)

LOCALITY AND HORIZON

Upper Devonian of the Hay River formation. Crickmay (1952, Oct.) stated that the stratigraphic range is the equivalent of the Alexo and Palliser formation.

DESCRIPTION

Shell medium to large, bi-convex, rotund in profile and outline. Greatest **width** at mid-length with maximum thickness near anterior margin. Costae coarse, round, beginning at mid-length.

Ventral valve convex. Beak upturned and hiding dorsal. Sinus very short, wide, abrupt, beginning mid-length, containing up to 5 costae. Flanks nearly flat except near beak, with up to 4 costae confined to antero-lateral margin.

Dorsal valve more convex than ventral. Fold low, gently rounded on top, beginning mid-length, with up to 5 commonly 3 costae. Lateral slopes very steep, early vertical, containing up to 4 costae on antero-lateral margins.



Internal structures of ventral valve consist of much reduced dental plates not reaching floor. No apparent teeth. Dorsal interior with wide, strong, medial septum; divided hinge plates with no apparent socket development. Crura strong, outgrowths of hinge plates.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
17.5	15	17.5	1.0	.9	.9
20	21	22	.9	.9	.9
21	22	22	.9	1.0	.9
12.5	13	12.5	.9	.9	1.0

#### COLLECTION AND REPOSITORY

Suite No. Dv. 1313, University of Alberta, Department of Geology.

#### DISCUSSION

Poor preservation is likely the reason no tooth and socket development was noticed during sectioning.

Genus Camarotoechia Hall and Clarke (1893)

Camarotoechia sp. cf. C. contracta (Hall and Clarke)

Pl. 3, figs. 52-56      Pl. 4, figs. 6-10.

1893 Camarotoechia contracta (Hall and Clarke), Pal. New York, 8, Pt. 2, p. 192, pl. 57, figs. 28-32, 49.

1909 Camarotoechia contracta (Hall)? Kindle, United States Geol. Surv., Bull. 391, p. 22, pl. 6, figs. 1-2A. (with included synonymy.)





## LOCALITY AND HORIZON

10 miles above mouth of N. Nahanni River, N. W. T., Upper Devonian, Hay River formation.

## DESCRIPTION

Shell small, bi-convex, triangular to sub-pentagonal in outline. Greatest width mid-length and maximum thickness at anterior margin. Costae angular, lateral costae finer than mesial, beginning at beaks.

Ventral valve convex, characterized by long, narrow, upturned, beak. Sinus short, deep, wide, abrupt, beginning mid-length, with 7 costae. Flanks wide, gently convex, containing up to 15 costae per side.

Dorsal valve more convex than ventral. Beak and umbo hidden by ventral beak. Fold nearly flat on top, prominent, beginning mid-length, with up to 6 costae. Lateral slopes convex at mid-length, steep near anterior margin, with 15 costae per side.

Internal structures of ventral valve consist of well developed dental plates extending to floor. Teeth well developed. Dorsal interior with strong, narrow, medial septum. Sockets on outer plates of hinge plates. Crura strong, deep, narrow, outgrowths of hinge plates. Segments of hinge plates attached to medial septum by supporting plates making short, small, cruralium (often covered with growth of inner hinge plates).



DIMENSIONS

L	W	T	L/T	W/T	W/L
10	14	11	.9	1.2	1.4
9	10	7	1.3	1.4	1.1

COLLECTION AND REPOSITORY

Suite No. Dv. 1314, University of Alberta, Department of Geology.

DISCUSSION

A Camarotoechia sp. from the Presqu'ile formation (p. 39.) bears a close resemblance to Camarotoechia sp. cf. C. contracta in size except that it has coarser and slightly fewer costae.

Camarotoechia shimeri Warren

Pl. 4, figs. 16-20.

1927 Camarotoechia shimeri Warren, Geol. Surv. Canada, mem. 153,  
p. 52, pl. 4, figs. 5-6

LOCALITY AND HORIZON

"Upper Devonian; uppermost beds of Minnewanka limestone on Sulphur mountain." (Warren 1927, p. 53)

DESCRIPTION

Shell medium in size, bi-convex (full grown specimens gibbous), sub-ovate in outline. Greatest width mid-length. Maximum thickness posterior to mid-length. Costae fine and round.



Ventral valve convex, with small beak, greatest curvature near umbo. Sinus shallow, long, wide, beginning posterior to mid-length, with approximately 12 costae. Flanks gently convex, wide, containing nearly 20 costae.

Dorsal valve more convex than ventral. Beak hidden. Fold beginning near mid-length, with 6 costae on flattened top and 4 on side. Lateral slopes gently convex with approximately 20 costae per side.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
16	18	8	2.0	2.2	1.1
16?	20	12	1.3?	1.7	1.4?

#### COLLECTION AND REPOSITORY

Suite Dv. 393, University of Alberta, Department of Geology.

#### DISCUSSION

Internal structures not investigated as only two specimens available.

This species differs from C. horsfordi (Hall) in that the striae are finer and more numerous.

Camarotoechia banffensis Warren

1927 Camarotoechia banffensis Warren, Geol. Surv. Canada, mem. 153,  
p. 51, pl. 4, figs. 7-9





## LOCALITY AND HORIZON

"Upper Devonian; upper beds on Minnewanka limestone on Sulphur mountain." (Warren 1927, p. 52)

## DESCRIPTION

"Shell subtriangular in outline, wider than long, the greatest width in front of the mid-length of the shell; postero-lateral margins but slightly convex, meeting at the beak in an angle of about 110 degrees; anterior margin truncate, the antero-lateral margins rounding rather sharply to it. Dimensions of the only specimen; length 20 mm., width 23 mm., thickness about 13 mm.

"Pedicule valve less convex than the brachial, rather flattened in the middle and sloping very abruptly to the postero-lateral margins. Mesial sinus obsolete in the posterior half of the valve, broad and shallow anteriorly and produced upward in a regularly rounded lingual extension to meet the fold of the brachial valve. Beak apparently pointed, but slightly incurved and produced beyond that of the brachial valve. Plications simple, angular, becoming nearly obsolete at the beak, about 36 in number, of which 12 occupy the mesial sinus.

"Brachial valve quite strongly convex, the greatest convexity apparently in front of the mid-length of the shell; surface sloping abruptly to the postero-lateral margins. Mesial fold obsolete in the posterior part of the valve and rather broad and flat anteriorly. Plications similar to those of the pedicle valve, 6 occupying the flat top of the fold and 3 considerable smaller ones occupying the slope on either side." (Warren 1927, p. 52).

## DISCUSSION

"The species is described from a single specimen in which the mesial fold is a little crushed and the beak of the ventral valve rather imperfect. The form bears a close resemblance to Camaro-toechia alleghonia (Williams), but the plications are finer and more numerous than those of that species and the fold and sinus of our species are distinctly broader than that of the eastern form." (Warren 1927, p. 52)





Camarotoechia sp. cf. C. unca Stainbrook

Pl. 4, figs. 1-5

1950 Camarotoechia unca Stainbrook, Jour. Pal., vol. 24, no. 3,  
p. 376, pl. 54, figs. 43-47.

LOCALITY AND HORIZON

Upper Devonian, Nisku (D-2) formation near top on Mount Meda,  
Jasper National Park, Alberta.

DESCRIPTION

Shell medium in size, bi-convex, triangular in outline. Greatest width and thickness anterior to mid-length. Commissure nearly straight line. Costae coarse, angular, beginning at beaks.

Ventral valve gently convex. Sinus long, abrupt, beginning near umbo, with 3 to 6 costae. Flanks wide, gently convex, with 10 to 12 costae.

Dorsal valve more convex than ventral. Beak incurved and hidden by long ventral beak. Fold narrow, high, beginning near the umbo, with 4 to 6 costae. Lateral slopes wide, steep, convex, containing 10 to 12 costae.

DIMENSIONS

L	W	T	L/T	W/T	W/L
21.5	23	16	1.3	1.4	1.0
21	24	16.5	1.2	1.4	1.1
18	19	13	1.4	1.4	1.0



COLLECTION AND REPOSITORY

Suite ME-B-13F, University of Alberta, Department of Geology.

DISCUSSION

These specimens are remarkably similar to C. unca Stainbrook. They differ only in that the plications may be finer.

Gamarotoechia sp.

Pl. 3, figs. 1-3 Pl. 4, figs. 26-30

LOCALITY AND HORIZON

Middle Devonian, Presqu'ile Point, Great Slave Lake, Presqu'ile formation. Also found in the Pine Point formation.

DESCRIPTION

Shell small, bi-convex, sub-pentagonal in outline. Greatest width mid-length. Maximum thickness at anterior margin. Costae coarse, sub-rounded, beginning at beaks.

Ventral valve convex. Beak small, long, upturned hiding dorsal. Sinus short, abrupt, beginning mid-length, with 3 to 4 costae. Flanks wide, gently convex containing approximately 6 costae.

Dorsal valve more convex than ventral. Fold, low, nearly flat on top, beginning mid-length with 4 to 5 costae. Lateral slopes, wide convex, containing around 6 costae on each side.

Internal structures of ventral valve consist of strong dental plates extending to floor. Dorsal interior with strong, deep medial



septum. Hinge line divided, two plates per side, the outer ones with sockets. Crura strong and deep.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
11	13	10	1.1	1.3	1.1
12	14.5	11	1.0	1.3	1.2
?	17	?	?	?	?

#### COLLECTION AND REPOSITORY

Suite 641 and 184, University of Alberta, Department of Geology.

#### DISCUSSION

This species is remarkably similar to Camarotoechia sp. cf. C. contracta (Hall and Clarke) in outline and profile, but differs in that the costae are much coarser on the flanks and less numerous, almost half as many.

Camarotoechia nordeggi Kindle

Pl. 4, figs. 11-15

1924 Camarotoechia nordeggi Kindle, Pan-American Geol., vol. 42,  
Oct. p. 218, pl. 14, figs. 8-10

#### LOCALITY AND HORIZON

South side Beaver Lake, Alberta, Palliser formation.





DESCRIPTION

Shell large, bi-convex, sub-circular in outline. Greatest width anterior to mid-length. Maximum thickness at anterior margin. Costae coarse, angular, beginning at beaks.

Ventral valve convex, Beak long, pointed, hiding dorsal. Sinus broad, long, beginning near umbo, with usually 9 costae. Flanks gently convex mid-length, near beak, steep, containing up to 14 costae.

Dorsal valve more convex than ventral. Fold prominent at anterior margin, round on top, beginning near umbo with up to 8 costae. Lateral slopes convex, steep, with usually 14 costae.

Internal structures of ventral valve consist of well developed dental plates, extending to floor. Teeth visible. Dorsal interior with strong, narrow, medial septum. Crura strong, deep, narrow, outgrowth of hinge plates. Segments of hinge plates attached to medial septum by supporting plates making short, small, cruralium. Hinge plate divided, sockets poorly developed or either poorly preserved.

DIMENSIONS

L	W	T	L/T	W/T	W/L
24	24	15	1.6	1.6	1.0
19	21	11	1.7	1.9	1.1



COLLECTION AND REPOSITORY

Suite 86, Union Oil Co. Ltd., University of Alberta, Department of Geology.

Genus Pugnoides Weller (1910)

Pugnoides kakwaensis McLaren

Pl. 2, figs. 45-51. Pl. 3, figs. 21-25.

1954 Pugnoides kakwaensis McLaren, Bull. American Ass. Pet. Geol.,  
Vol. 2, no. 1, p. 176, pl. 1, figs. 28-32

LOCALITY AND HORIZON

Upper Devonian in the Lower Flume formation, Ancient Wall, Alberta. McLaren stated that he found specimens from the lower member of the Flume formation.

DESCRIPTION

Shell large, bi-convex, elliptical in outline. Greatest width mid-length. Maximum thickness anterior to mid-length. Costae angular, confined to anterior margin.

Ventral valve nearly flat, slightly convex posteriorly. Beak small and incurved. Sinus broad, deep, abrupt, beginning anterior to mid-length, with 2 to 4 costae. Flanks flattened, containing 4 to 6 costae.

Dorsal valve strongly convex. Beak incurved and hidden. Fold narrow, round, beginning anterior to mid-length, with 2 to 4 costae. Lateral slopes convex, very broad, steep, containing 4 to 6 costae.



Internal structures of ventral valve consist of strong, wide dental plates extending to floor. Teeth not seen and may be obsolete. Dorsal interior with strong medial septum. Crura outgrowths of hinge plate. Hinge plate divided and consists of 2 plates per side, outer ones stronger with no apparent socket development.

#### DIMENSIONS

L	W	T	L/T	W/T	W/L
21	28	18	1.1	1.5	1.3

#### COLLECTION AND REPOSITORY

Suite 142, Union Oil Co. Ltd., University of Alberta, Department of Geology.

#### DISCUSSION

This species is larger with fewer costae on the fold and more on the flanks than P. schucherti Stainbrook. It differs from P. sandersoni Warren in being considerably more transverse, with flatter flanks.

Pugnoides sp. cf. P. duplicatus (Hall)

Pl. 3, figs. 26-30

1843 Atrypa duplicata Hall, Report on 4th Geol. District New York, no pp. pl. 67, fig. 2-2A

1866 Rhynchonella (Stenocisma) duplicata. Hall, Geol. Surv. New York, vol. 4, pt. 1, p. 350 pl. 55 figs. 17-25

1944 Pugnoides duplicatus (Hall) Shimer and Shrock, Index Fossils of N. America, p. 315, pl. 120, figs. 18-21





LOCALITY AND HORIZON

One specimen, 10 miles above the mouth of the N. Nahanni River, N. W. T., Upper Devonian, Hay River formation.

DESCRIPTION

Shell small to medium, bi-convex, sub-circular in outline. Greatest width mid-length. Maximum thickness at anterior margin. Costae coarse, angular, beginning near umbo.

Ventral valve convex, with small beak. Sinus long, narrow, tongue-like, beginning near umbo, with 1 costae. Flanks flat, with trace of costae at antero-lateral margin.

Dorsal valve more convex than ventral. Beak hidden. Fold high, prominent, beginning one-third length, marked by 2 costae. Lateral slopes convex, smooth, wide.

DIMENSIONS

L	W	T	L/T	W/T	W/L
16	18	10	1.6	1.8	1.1

COLLECTION AND REPOSITORY

Suite No. Dv. 1315, University of Alberta, Department of Geology.

DISCUSSION

This specimen is larger than the one illustrated and described in Index Fossils of North America, p. 315. Also that specimen has



3 unequal sized costae on the flanks.

Hume (1922, p. 71B) reported P. duplicatus as rare in the "Leiorhynchus zone" of the Hay River formation.

Internal structures not investigated as only one specimen was available.

Genus Hypothyridina Buckman (1906)

Hypothyridina sp. cf. H. emmonsi (Hall and Whitfield)

Pl. 2, figs. 57-60. Pl. 3, figs. 31-34

1877 Rhynchonella emmonsi Hall and Whitfield, United States Geol. Expl. 40th Par. (King), vol. 4, p. 247, pl. 3, figs. 4-8.

1944 Hypothyridina cf. emmonsi (Hall and Whitfield) Warren, Trans. Royal Soc. Canada, ser. 3, vol. 38, sec. 4, p. 113, pl. 2, figs. 13-14.

LOCALITY AND HORIZON

Upper Devonian, Ancient Wall, Alberta

DESCRIPTION

Shell medium to large, bi-convex, rotund in profile, sub-circular in outline. Greatest width mid-length. Maximum thickness varies from mid-length to slightly anterior. Costae broad, round, beginning near the beaks.

Ventral valve convex. Beak small, upturned, hiding dorsal. Sinus narrow, short, abrupt, beginning mid-length, with 8 costae.



Flanks wide, gently convex mid-length, steeply convex near beak.

Dorsal valve more convex than ventral. Fold narrow, low, round on top, beginning mid-length with 8 costae. Lateral slopes steep, wide, containing 20 costae per side.

Internal structure of ventral valve consist of strong dental plates extending to floor. Dorsal interior has no medial septum. The hinge plate divided, broad, with no definite sockets. Crura outgrowths of hinge plates.

DIMENSIONS

L	W	T	L/T	W/T	W/L
21	22	18.5	1.1	1.2	1.0

COLLECTION AND REPOSITORY

Suite No. Dv. 1321, University of Alberta, Department of Geology.

Hypothyridina cameroni Warren

Pl. 4, figs. 21-25

1944 Hypothyridina cameroni Warren, Trans. Royal Soc. Canada, ser. 3, vol. 38, sec. 4, p. 114, pl. 2, figs. 11-12

LOCALITY AND HORIZON

Middle Devonian Presqu'ile formation, at Presqu'ile Point on Great Slave Lake.





## DESCRIPTION

Shell large, bi-convex, rotund in profile, pentagonal in outline. Greatest width slightly posterior to mid-length. Maximum thickness near anterior margin. Costae broad, round, beginning near beaks.

Ventral valve with small beak, greatest convexity at umbo. Sinus broad, deep, abrupt, beginning mid-length with 9 costae. Flanks broad, nearly flat at mid-length, containing approximately 13 costae.

Dorsal valve more convex than ventral. Beak hidden. Fold low, broad, nearly flat on top, beginning mid-length with 8 costae. Lateral slopes wide, relatively steep, containing 13 costae per side.

## DIMENSIONS

L	W	T	L/T	W/T	W/L
21	25	18	1.1	1.4	1.2
17	21	15	1.1	1.4	1.2

## COLLECTION AND REPOSITORY

Suite Dv. 849 and Dv. 851, University of Alberta, Department of Geology.

## DISCUSSION

Internal structures not investigated as only two museum specimens were available.



Hypothyridina sp. cf. H. magister Belanski

P. 4, figs. 31-35

1928 Hypothyridina magister Belanski, American Mid. Nat., vol. 11,  
no. 5, p. 198, pl. 15, figs. 1-6

1944 Hypothyridina cf. magister Belanski, Warren, Trans. Royal Soc.  
Canada. ser. 3, vol. 38, sec. 4, p. 114, pl. 2, figs. 15.

LOCALITY AND HORIZON

Upper Devonian, Bosworth formation, 12 miles above the mouth  
of the Dahadinni River, N. W. T.

DESCRIPTION

Shell large, bi-convex, occasionally rotund in profile, sub-  
circular in outline. Greatest width mid-length. Maximum thick-  
ness at anterior margin. Costae coarse, round, beginning at beaks.

Ventral valve convex. Beak small, long, pointed, hiding dorsal.  
Sinus short, abrupt, wide, beginning mid-length, with 9 to 10 costae.  
Flanks nearly flat mid-length, steeply convex at posterior and  
anterior margin, containing 15 costae per side.

Dorsal valve more convex than ventral. Fold wide, low, round  
on top, beginning mid-length, with 9 costae. Lateral slopes steeply  
convex, wide, containing 15 costae per side.

DIMENSIONS

L	W	T	L/T	W/T	W/L
24	31	24	1.0	1.3	1.3
22	30	16.5	1.3	1.8	1.4



COLLECTION AND REPOSITORY

Suite Dv. 847 and 41046, University of Alberta, Department of Geology.

DISCUSSION

Internal structures not investigated as only two museum specimens were available.

Genus Eatonia Hall (1857)

Eatonia sp.

Pl. 2, figs. 41-44 Pl. 3, figs. 16-20

LOCALITY AND HORIZON

Upper Devonian, Hay River formation, Root River, N. W. T.

DESCRIPTION

Shell small to medium, bi-convex, rotund, sub-circular in outline. Greatest width mid-length, and maximum thickness varies from mid-length to anterior margin. Costae angular, coarse, confined to antero-lateral margin.

Ventral valve convex. Beak small, short, upturned, hiding dorsal. Sinus short, deep, abrupt, beginning mid-length, with 2 to 3 costae. Flanks nearly flat mid-length, steeply convex at anterior and posterior margins, containing 2 costae.

Dorsal valve more convex than ventral. Fold low, nearly flat on top, beginning mid-length, with 3 to 4 costae. Lateral slopes





convex, steep, containing 2 costae.

Internal structures of ventral valve consist of much reduced or absent dental plates, large and flabellate muscular field. Dorsal interior with erect shaft resting on medial septum; myphore divided into two branches. Crura long (not positive jugum present).

DIMENSION

L	W	T	L/T	W/T	W/L
13	15	13	1.0	1.1	1.1
15	17	15	.9	1.1	1.2
13	14	10	1.3	1.4	1.1
14	16	11	1.2	1.4	1.1
12	13	8	1.5	1.6	1.1
12	13	5	2.4	2.6	1.1
13	14	10	1.3	1.4	1.1

COLLECTION AND REPOSITORY

Suite 43948 University of Alberta, Department of Geology.



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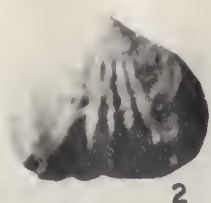
PLATE 1

- Figures 1- 5. Nudirostra utahensis (Kindle). Views of specimen 1, dorsal; 2, ventral; 3, anterior; 4, posterior; 5, side. University of Alberta, Suite No. Dv. 1320 A well in southern part of Alberta, green shale, undoubtable Three Forks. (Page 18)
- Figures 6-10. Nudirostra sp. cf. N. utahensis (Kindle). Views of specimen. 6, dorsal; 7, ventral; 8, anterior; 9, posterior; 10, side. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N.W.T. (Page 19)
- Figures 11-15. Nudirostra sp. cf. N. utahensis (Kindle). Views of specimen. 11, dorsal; 12, ventral; 13, anterior; 14, posterior; 15, side. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N. W. T. (Page 19)
- Figures 16-20. Nudirostra walcotti var. seversoni (McLaren). Views of specimen. 16, dorsal; 17, ventral; 18, anterior; 19, posterior; 20, side. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N.W.T. (Page 21)
- Figures 21-25. Nudirostra walcotti walcotti (Merriam). Views of specimen. 21, dorsal; 22, ventral; 23, anterior; 24, posterior; 25, side. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N. .T. (Page 23)
- Figures 26-30. Nudirostra albertensis (Warren). Views of specimen 26, dorsal; 27, ventral; 28, anterior; 29, posterior; 30, side. University of Alberta. Suite 18 B. (Page 24)
- Figures 31-35. Nudirostra sp. Views of specimen. 31, dorsal; 32, ventral; 33, anterior; 34, posterior; 35, side. University of Alberta. Suite 42015 and 42023, formation not known. (Maybe Hare Indian or Fort Creek.) Ramparts Plateau, Mackenzie River, N.W.T. (Page 26)
- Figures 36-40. Basilicorhynchus basilicum Crickmay. Views of specimen. 36, dorsal; 37, ventral; 38, anterior; 39, posterior; 40, side. University of Alberta. Suite Dv. 1313, Hay River formation, N. Nahanni River, N.W.T. (Page 32)

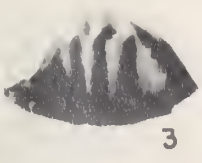




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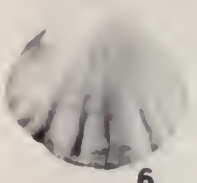
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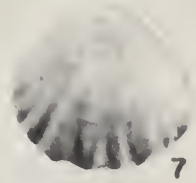
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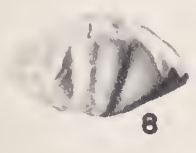
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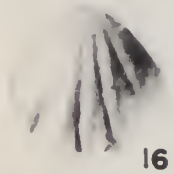
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PLATE 2

- Figures 1- 3. Camarotoechia sp. Views of serial sections through the beaks. University of Alberta. Suite 641, Presqu'ile formation, Presqu'ile Point, Great Slave Lake. (Page 39)
- Figures 4- 8. Nudirostra albertensis (Warren). Views of serial sections through the beaks. University of Alberta. Suite 18B. (Page 24)
- Figures 9-14. Nudirostra walcotti var. seversoni McLaren. Views of serial sections through the beaks. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N. W. T. (Page 21)
- Figures 15-22. Nudirostra sp. cf. N. utahensis (Kindle). Views of serial sections through the beaks. University of Alberta. Suite 717, Hay River formation, Camsell Bend, Mackenzie River, N. W. T. (Page 19)
- Figures 23-29. Nudirostra sp. Views of serial section through the beaks. University of Alberta. Suite 42015, formation not known. (Maybe Hare Indian or Fort Creek). Ramparts Plateau, Mackenzie River, N. W. T. (Page 26)
- Figures 30-34. Basilicorhynchus basilicum (Crickmay). Views of serial sections through the beaks. University of Alberta. Suite Dv. 1313, Hay River formation, N. Nahanni River, N. W. T. (Page 32)
- Figures 35-40. Nudirostra castanea var. b. Views of serial sections through the beaks. University of Alberta. Suite 184, Pine Point formation, Dawson Landing, Great Slave Lake. (Page 30)
- Figures 41-44. Eatonia sp. Views of serial sections through the beaks. University of Alberta. Suite 43948, Hay River formation, Root River, N. W. T. (Page 49)
- Figures 45-51. Pugnoides kakwaensis McLaren. Views of serial sections through the beaks. University of Alberta. Suite 142, Union Oil Co. Ltd., Lower Flume formation, Ancient Wall, Alberta. (Page 42)
- Figures 52-56. Camarotoechia sp. cf. C. contracta (Hall and Clarke). Views of serial sections through the beaks. University of Alberta. Suite Dv. 1314, Hay River formation, N. Nahanni River, N. W. T. (Page 33)
- Figures 57-60. Hypothyridina sp. cf. H. emmonsii (Hall and Whitfield). Views of serial sections through the beaks. University of Alberta, Suite No. Dv. 1321. Upper Devonian, Ancient Wall, Alberta. (Page 45)

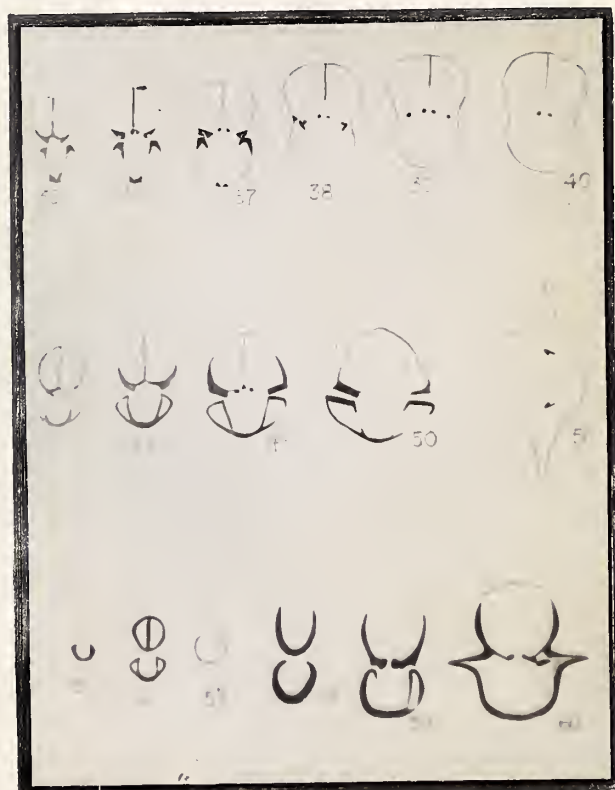
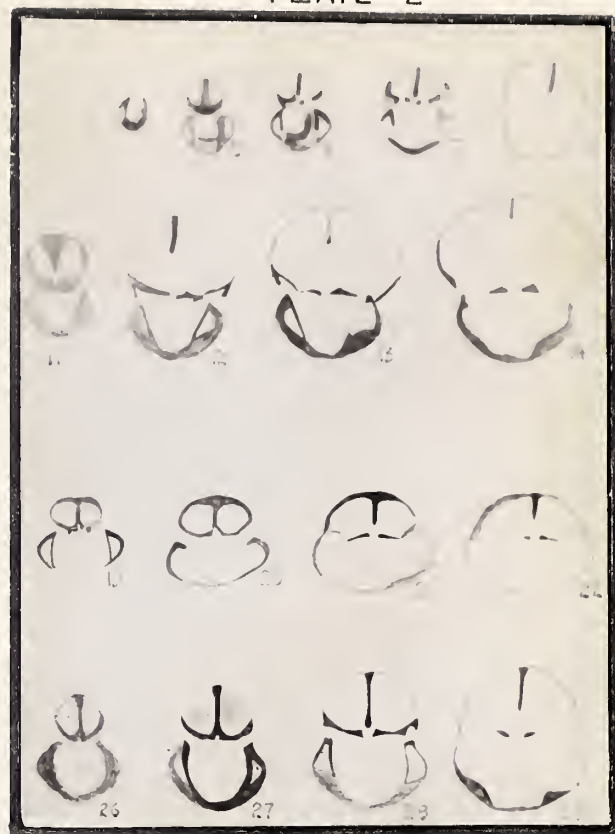
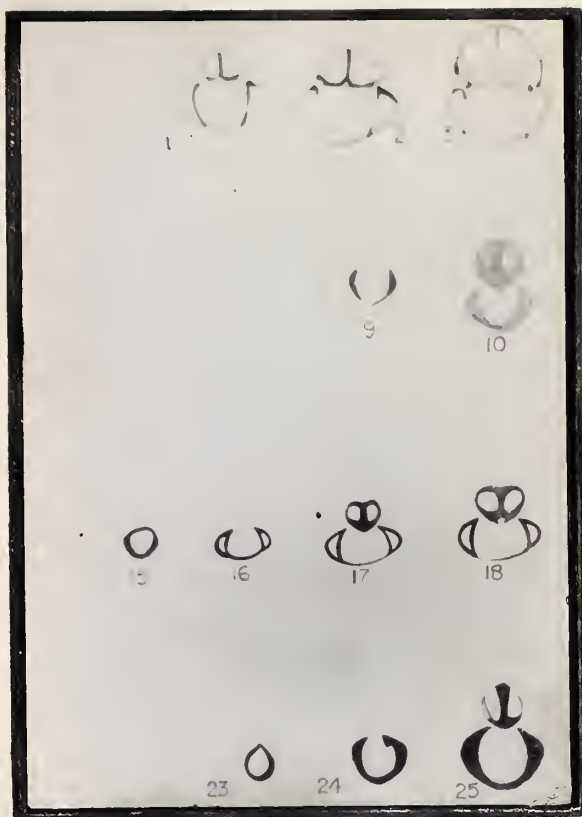




PLATE 3

- Figures 1- 5. Nudirostra castanea castanea (Meek). Views of specimen 1, dorsal; 2, ventral; 3, anterior; 4, posterior; 5, side. University of Alberta. Suite 45595, Basal Fort Creek formation. (Page 28)
- Figures 6-10. Nudirostra castanea var. a. Views of specimen. 6, dorsal; 7, ventral; 8, anterior; 9, posterior; 10, side. University of Alberta. Suite Dv. 1316. Upper Ramparts (Beavertail), Norman Wells area, N. W. T. (Page 29)
- Figures 11-15 Nudirostra castanea var. b. Views of specimen. 11, dorsal; 12, ventral; 13, anterior; 14 posterior; 15, side. University of Alberta. Suite 184, Pine Point formation, Dawson Landing, Great Slave Lake. (Page 30)
- Figures 16-20. Eatonia sp. Views of specimen. 16, dorsal; 17, ventral; 18 anterior; 19 posterior; 20, side. University of Alberta. Suite 43948. Hay River formation, Root River, N. W. T. (Page 49)
- Figures 21-25 Pugnoides kakwaensis McLaren. Views of specimen. 21, dorsal; 22, ventral; 23, anterior; 24, posterior; 25, side. University of Alberta. Suite 142, Union Oil Co. Ltd., Lower Flume, Ancient Wall, Alberta. (Page 42)
- Figures 26-30. Pugnoides sp. cf. P. duplicatus (Hall). Views of specimen. 26, dorsal; 27, ventral; 28, anterior; 29 posterior; 30, side. University of Alberta, Suite Dv. 1315, Hay River formation, W. Nahanni River, N. W. T. (Page 43)
- Figures 31-34. Hypothyridina sp. cf. H. emmonsii (Hall and Whitfield). Views of specimen. 31, dorsal; 32, ventral; 33, anterior; 34, posterior. University of Alberta, Suite No. Dv. 1321, Upper Devonian, Ancient Wall, Alberta. (Page 45)



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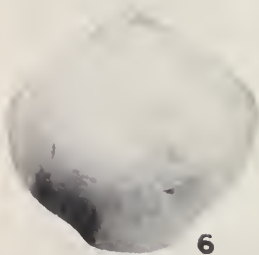
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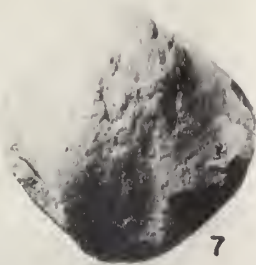
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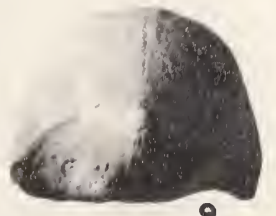
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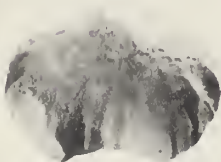
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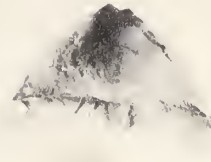
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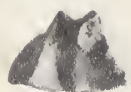
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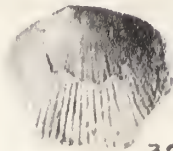
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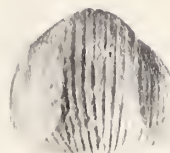
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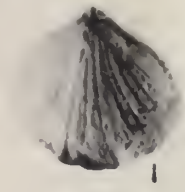


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PLATE 4

- Figures 1- 5. Camarotoechia sp. cf. C. unca Stainbrook. Views of specimen. 1, dorsal; 2, ventral; 3, anterior; 4, posterior; 5, side. University of Alberta. Suite ME-B-13F, Nisku (D-2) formation, Mount Meda, Jasper National Park, Alberta. (Page 38)
- Figures 6-10. Camarotoechia sp. cf. C. contracta (Hall and Clarke). Views of specimen. 6, dorsal; 7, ventral; 8, anterior; 9, posterior; 10, side. University of Alberta. Suite Dv. 1314, Hay River formation, N. Nahanni River, N.W.T. (Page 33)
- Figures 11-15. Camarotoechia nordeggi Kindle. Views of specimen. 11, dorsal; 12, ventral; 13, anterior; 14, posterior; 15, side. University of Alberta. Suite 86, Union Oil Co. Ltd. Palliser formation, S. side of Beaver Lake, Alberta. (Page 40)
- Figures 16-20. Camarotoechia shimeri Warren. Views of specimen. 16, dorsal; 17, ventral; 18, anterior; 19, posterior; 20, side. University of Alberta. Suite Dv. 393, Upper beds of Banff limestone (Palliser), Sulphur Mountain, Banff National Park, Alberta. (Page 35)
- Figures 21-25. Hypothyridina cameroni Warren. Views of specimen. 21, dorsal; 22, ventral; 23, anterior; 24, posterior; 25, side. University of Alberta. Suite Dv. 849, Presqu'ile formation, Presqu'ile Point, Great Slave Lake. (Page 46)
- Figures 26-30 Camarotoechia sp. Views of specimen. 26, dorsal; 27 ventral; 28, anterior; 29, posterior; 30, side. University of Alberta. Suite 641, Presqu'ile formation, Presqu'ile Point, Great Slave Lake. (Page 39)
- Figures 31-35. Hypothyridina sp. cf. H. magister Belanski. Views of specimen. 31, dorsal; 32, ventral; 33, anterior; 34 posterior; 35, side. University of Alberta. Suite Dv. 847, Bosworth sandstone of Imperial formation, Dahadinni River, N.W.T. (Page 48)





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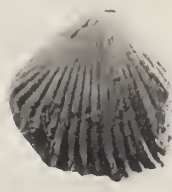
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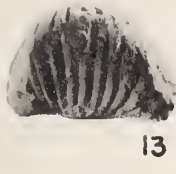
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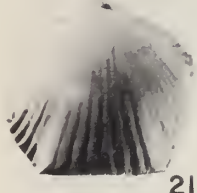
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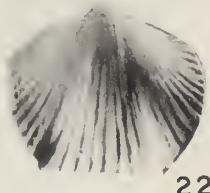
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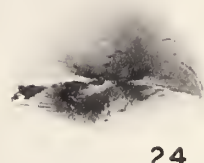
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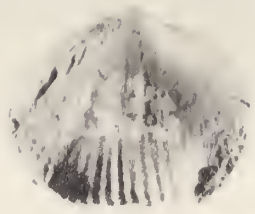
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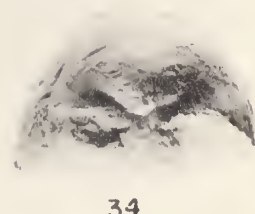
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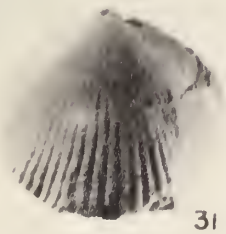
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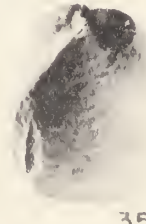
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APPENDIX A

<u>LIST OF STUDIED AND DESCRIBED DEVONIAN RHYNCHONELLIDS</u>	<u>Page</u>
Nudirostra utahensis (Kindle) -----	18
Nudirostra sp. cf. N. utahensis (Kindle) -----	19
Nudirostra walcotti var. seversoni McLaren -----	21
Nudirostra walcotti walcotti Merriam -----	23
Nudirostra albertensis (Warren) -----	24
Nudirostra sp. -----	26
Nudirostra castanea castanea (Meek) -----	28
Nudirostra castanea var. a -----	29
Nudirostra castanea var. b -----	30
[Caryorhynchus carya (Crickmay)] -----	31
Basilicorhynchus basilicum (Crickmay) -----	32
Camarotoechia sp. cf. C. contracta (Hall and Clarke) -----	33
Camarotoechia shimeri Warren -----	35
[Camarotoechia banffensis Warren] -----	37
Camarotoechia sp. cf. C. unca Stainbrook -----	38
Camarotoechia sp. -----	39
Camarotoechia nordeggi Kindle -----	40
Pugnoides kakwaensis McLaren -----	42
Pugnoides sp. cf. P. duplicatus (Hall) -----	43
Hypothyridina sp. cf. H. emmonsii (Hall and Whitfield) -----	45
Hypothyridina cameroni Warren -----	46
Hypothyridina sp. cf. H. magister Belanski -----	48
Eatonia sp. -----	49

Species in large brackets represent quoted descriptions



APPENDIX B

List of Sectioned Rhynchonellids

- \* *Nudirostra* sp. cf. *N. utahensis*  
*Nudirostra walcotti walcotti*
- \* *Nudirostra walcotti* var. *seversoni*
- \* *Nudirostra* sp.
- \* *Nudirostra albertensis*  
*Nudirostra castanea castanea*  
*Nudirostra castanea* var. *a*
- \* *Nudirostra castanea* var. *b*
- \* *Basilicorhynchus basilicum*  
*Camarotoechia nordeggi*
- \* *Camarotoechia* sp. cf. *C. contracta*
- \* *Camarotoechia* sp.
- \* *Pugnoides kakwaensis*
- \* *Hypothyridina* sp. cf. *H. emmonsii*
- \* *Eatonia* sp.

The asterisk species are shown on plate 2.











**B29770**